

# TWO CONODONT FAUNAS FROM THE LOWER CARBONIFEROUS OF CHUDLEIGH, SOUTH DEVON

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ABSTRACT. Two conodont faunas are reported from the Lower Carboniferous of Chudleigh, south Devon. The lower includes *Siphonodella cooperi*, *S. isosticha* and *Gnathodus* aff. *semiglaber*. The higher has these siphonodellids in association with *Scaliognathus anchoralis*. Comparisons are made with other European and with North American records.

Two conodont faunas collected at Chudleigh by Professor M. R. House and Mr. N. E. Butcher provide proof of the Dinantian age of part of the stratigraphic succession there. Only some details of the fauna are given here. The occurrences of conodonts will be discussed in their wider geological context in House and Butcher's forthcoming paper on the Chudleigh district.

The lower of the two faunas comes from the southern side of a track 110 ft. WSW. of Winstow Cottages and immediately below a quarry in the Winstow Cherts. The horizon is almost at the base of the Winstow Cherts of House and Butcher. The conodont material exists in this case as empty moulds of specimens in the siliceous shale. The higher fauna was found in siliceous shales exposed in a temporary trench cut beside a hedge at a point 180 ft. to the south-west of Winstow Cottages. House and Butcher place this horizon in the lithological transition from Winstow Cherts to Posidonia Shales (see their paper). This second collection of material showed light-coloured conodont specimens (presumably degraded remnants of the originally phosphatic microfossils) set in now slightly coarser siliceous rocks. It proved useful to remove the substance of these specimens with concentrated hydrochloric acid in order to produce again a set of moulds. Rubber casts could then be prepared and studied.

The following have been identified:

Lower fauna	Higher fauna
<i>Falcodus</i> ? sp.	<i>Gnathodus delicatus</i> Branson and Mehl
<i>Gnathodus</i> aff. <i>semiglaber</i> (Bischoff)	<i>Gnathodus semiglaber</i> (Bischoff)
<i>Gnathodus</i> sp.	<i>Gnathodus texanus</i> (sensu germanico)
<i>Hindeodella</i> sp. indet.	<i>Gnathodus</i> cf. <i>punctatus</i> (Cooper)
<i>Polygnathus communis</i> Branson & Mehl	<i>Hindeodella</i> cf. <i>segaformis</i> Bischoff
<i>Siphonodella cooperi</i> Hass	<i>Polygnathus</i> sp.
<i>Siphonodella isosticha</i> (Cooper)	<i>Pseudopolygnathus triangula pinnata</i> Voges
<i>Chondrites</i> sp. and other ichnofossils	<i>Scaliognathus anchoralis</i> Branson and Mehl
	<i>Siphonodella cooperi</i> Hass
	<i>Siphonodella sexplicata</i> (Branson and Mehl)
	<i>Siphonodella isosticha</i> (Cooper)
	Ostracods
	Chitinophosphatic brachiopod

The conodonts, ostracods, and the chitinophosphatic brachiopod may be taken to be representatives of the pelagic fauna of the times. The ichnofossils, on the other hand, record the activity of members of an endofauna. It may be observed that there is no systematic relationship between the distribution of the conodonts and the courses taken by the endobionts.

The matter of the ages of the two faunas demands careful discussion. The lower fauna may be treated as resembling some mentioned by Voges (1960) and regarded by him as having their place in the upper part of his *Siphonodella crenulata*-Zone. He identified, in these cases, relatively early occurrence of *Gnathodus semiglaber* in association with siphonodellids. Ziegler (1960) reported a gnathodid-siphonodellid association from a pre-*anchoralis*-Zone situation and Böger (1962) recorded a similar coincidence of form. All of these authors, at their times of writing, would have suggested that a *Siphonodella crenulata*-Zone conodont fauna implies  $\text{cuII}\alpha$  age by the cephalopod-based Dinantian standard. Likewise, a first statement on the Chudleigh Dinantian conodont faunas (reported in House and Butcher 1962) gave the age of the lower fauna as  $\text{cuII}\alpha$ . But this equation can now be seen to be invalid (Matthews, in press). The only permissible translation into cephalopod terms would suggest that the *Siphonodella crenulata*-Zone post-dates the Hangenbergkalk ( $\text{cuI}$ ) and pre-dates any western European  $\text{cuII}$  cephalopod fauna recorded in the literature.

The higher fauna may be referred with confidence to Voges's *anchoralis*-Zone. *Scaliognathus anchoralis* and *Hindeodella* cf. *segaformis* have been identified, and nothing in the remaining elements of the fauna would contradict their indication of age. Conodont faunas of this character have been obtained from  $\text{cuII}$  horizons.

Comparisons with American findings are instructive. The lower fauna, with *Siphonodella cooperi*, *S. isosticha*, *Polygnathus communis*, and the gnathodids, matches in many respects the association of form reported by Collinson, Scott, and Rexroad (1962) from the late Kinderhookian of the Mississippi Valley and treated by them as determining a *Siphonodella* n. sp. A–*Siphonodella cooperi* Zone. Later, Rexroad and Scott (1964) advised that *Siphonodella* n. sp. A should have the name *Siphonodella isosticha*. These American investigations produced no account of the *anchoralis*-Zone fauna which European experience (now repeated again at Chudleigh) had shown to succeed the faunas dominated by siphonodellids. Instead, Collinson, Scott, and Rexroad (1962) referred to a major unconformity as fixing the local upper limit of occurrence of *Siphonodella* and other forms in the Mississippi Valley. The fact of interruption was not, however, made plain in their offer of a sequence of zones, nor in their set of proposals on European correlatives. Rexroad and Scott's (1964) paper made more explicit reference (fig. 1 of their paper) to a gap in the Mississippi Valley standard. Burton (1964) has recorded the presence in the Mississippian of New Mexico of *Scaliognathus*, *Doliognathus* and other forms familiar in Europe. He emphasizes (personal communication) the fact that faunal breaks are sharp and coincide with member or formation boundaries throughout the Mississippian of the Sacramento Mountains. From these observations he reasonably draws the conclusion that the ranges of particular forms might appear to be quite different in fuller rock-successions elsewhere. Thompson (1967) encountered *Scaliognathus* and *Doliognathus* in his study of certain conodont faunas from southwestern Missouri. It was in fact in the Mississippian of that region that these two genera were first found (Branson and Mehl 1941).

The two faunas from Chudleigh are from a single section in basal stratigraphy, and the higher fauna shows coincidence of *Scaliognathus* and siphonodellids. No such coincidence is encountered in North America. One possible interpretation of the Chudleigh evidence is that there is recorded, here, a set of associations of conodonts the pattern of whose occurrence in the Mississippian is distorted by interruptions of the stratigraphic succession. If the Mississippian evidence is not in this way distorted, it may be necessary to recognize a differentiation of faunas by which the *anchoralis*-Zone associations recorded in Europe were made distinct from their Mississippian contemporaries. But in that case, there would remain the fact that no such differentiation is evident in the faunas of time immediately preceding.

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#### SYSTEMATIC NOTES

Numbers given, with prefix LZ, refer to the collections of the Institute of Geological Sciences (Geological Survey and Museum). Each four-figure number identifies a rock specimen. A fifth figure, added as a suffix, identifies one particular conodont mould among the number available on the surface of that rock specimen. Thus in Plate 51, figs. 1 and 2 (oral and aboral views of *Scaliognathus anchoralis*) are both taken from LZ 5660 and cannot refer to one and the same conodont. Conversely, figs. 3 and 4 on that plate (aboral and oral views of *Polygnathus* sp.) although they refer to rock-specimens LZ 5664 and LZ 5665, do represent two different aspects of a single individual, revealed as moulds on a rock surface (on 5664) and its counterpart (on 5665).

#### *Falcodus* ? sp.

Plate 51, fig. 10

*Material.* LZ 5649.

*Remarks.* Hass (1959) illustrated a *Falcodus* from the Chappell limestone of Texas and Klapper (1966), too, has recorded a Mississippian falcodid. Krebs (1960) reported *Falcodus* ? sp. in a *triangula inaequalis*-Zone fauna and Dvořák and Freyer (1961) listed *Falcodus* sp. A and *Falcodus* sp. B in a fauna which they suggested to be of an age near

#### EXPLANATION OF PLATE 51

All figures  $\times 30$ .

- Figs. 1–10 refer to conodonts in the higher fauna, and 11–18 to conodonts in the lower fauna.  
 Figs. 1, 2. *Scaliognathus anchoralis*. 1, Aboral view of LZ 5660/2. 2, Oral view of LZ 5660/3.  
 Figs. 3, 4. *Polygnathus* sp. Oral (LZ 5664, fig. 3) and aboral (LZ 5665, fig. 4) views of one conodont.  
 Figs. 5, 16. *Siphonodella isosticha*. LZ 5662/1, LZ 5652/1 Oral.  
 Fig. 6. *Siphonodella sexplicata* LZ 5660/1, Oral.  
 Fig. 7. *Gnathodus delicatus*. LZ 5661/2. Oral.  
 Fig. 8. *Pseudopolygnathus triangula pinnata*. LZ 5663. Oral.  
 Figs. 9, 14, 15. *Siphonodella cooperi*. LZ 5661/1, LZ 5653, LZ 5650. Oral.  
 Fig. 10. *Falcodus* ? sp. LZ 5649. Lateral.  
 Fig. 11. *Polygnathus communis* LZ 5651/1. Oral.  
 Fig. 12. *Gnathodus* cf. *punctatus*. LZ 5666. Oral.  
 Fig. 13. *Siphonodella* sp. LZ 5651/2. Aboral.  
 Figs. 17, 18. *Gnathodus* aff. *semiglaber*. Oral views of LZ 5659 and LZ 5658.



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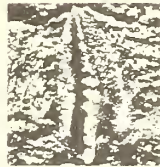
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